Climate-Smart Research for the Farms of the Future

Tuesday, September 12, 2023

Materials will be available at: www.eesi.org/091223farmbill
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**Non-partisan Educational Resources for Policymakers**
A bipartisan Congressional caucus founded EESI in 1984 to provide non-partisan information on environmental, energy, and climate policies.

**Direct Assistance for Equitable and Inclusive Financing Program**
In addition to a full portfolio of federal policy work, EESI provides direct assistance to utilities to develop “on-bill financing” programs.

**Commitment to Diversity, Equity, Inclusion, and Justice**
We recognize that systemic barriers impede fair environmental, energy, and climate policies and limit the full participation of Black, Indigenous, people of color, and legacy and frontline communities in decision-making.

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Live, in-person and online public briefings, archived webcasts, and written summaries

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Active engagement on Twitter, Facebook, LinkedIn, and YouTube
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- Congressional briefings
- Articles and podcasts
- Climate Change Solutions newsletter special editions
- Farm Bill hearing tracker
- Legislative side-by-side-by-sides

All resources available at: www.eesi.org/2023-farm-bill
Briefing Series: Farm Bill in Focus

The Process and Path Forward for Passing a Bipartisan Farm Bill | Recording Available

Climate, Energy, and Economic Win-Wins in the Farm Bill | Recording Available

Unlocking Rural Economies: Farm Bill Investments in Rural America | Recording Available

The Future of Forestry in the Farm Bill | Recording Available

Conservation Practices from Farms to Forests and Wetlands | Recording Available

Climate-Smart Research for the Farms of the Future
Funding
Climate-Smart Research

September 12, 2023
Dan Blaustein-Rejto
Director of Food and Agriculture
The Value of Public Agricultural R&D

- Key driver of productivity growth, keeping US farmers competitive
- Reduces food prices
- Crowds-in private investment, rather than crowding it out
- $20 benefit-cost ratio
- Develops practices and technologies to address environmental issues
- Reduces greenhouse gas emissions for as low as $12/tCO₂e
Public Spending on Agricultural R&D has Fallen by One-Third Since 2002

Notes: Spending on public agriculture R&D includes federal, state, and non-government funds used for food, agriculture, and forestry research by the USDA, land-grant universities, and other cooperating institutions. Spending is in 2019 dollars adjusted for inflation using the National Institutes of Health Biomedical Research and Development Price Index. The spike in R&D spending in 1976 was the result of an adjustment in the federal fiscal year, in which 1976 included five quarters of spending.
Farm Bill Title 7: Research, Extension and Related Matters

- Title 7 supports agricultural research and extension programs to expand academic knowledge and help producers be more productive.
- Research accounted for <0.2% of all 2018 Farm Bill mandatory spending.
- Many research programs are authorized to receive mostly discretionary (appropriated) funds.

Source: CRS using the CBO Baseline (May 2023) for the five largest titles, and amounts in law for programs in other titles.
Note: Total estimated at $1,463 billion.
Research Program Funding for Climate Mitigation (2017–2021 average)

Notes: ARS mitigation and USGCRP reflect USDA estimates of enacted funding for FY21. Funding by mitigation area is not calculated owing to data limitations. Other funding is calculated based on analysis of project descriptions over 2017–2021.
Foundation for Food and Agriculture Research

• $600+ million awarded and matched to-date

• $1.40 in non-federal matching funding for every $1 awarded

• Up to 40% of awards support climate-smart agriculture

• Over 40% of projects develop tools for immediate use
Foundation for Food and Agriculture Research

FFAR Awards by Year

Source: FFAR

©Breakthrough Institute
Agriculture Advanced R&D Authority

- Long-term, high-risk, high-return R&D
- Modeled after successful ARPA-style agencies
- Authorized in 2018 Farm Bill for $50M but appropriated $1 million per year

<table>
<thead>
<tr>
<th>Program</th>
<th>Department</th>
<th>FY 2023 Appropriations</th>
</tr>
</thead>
<tbody>
<tr>
<td>DARPA (Defense Advanced Research Projects Agency)</td>
<td>Defense</td>
<td>$4.1 billion</td>
</tr>
<tr>
<td>ARPA E (Advanced Research Projects Agency Energy)</td>
<td>Energy</td>
<td>$470 million</td>
</tr>
<tr>
<td>ARPA I (Advanced Research Projects Agency Infrastructure)</td>
<td>Transportation</td>
<td>$3.2 million</td>
</tr>
<tr>
<td>ARPA H (Advanced Research Projects Agency Health)</td>
<td>HHS</td>
<td>$1.5 billion</td>
</tr>
<tr>
<td>AGARDA (Agriculture Advanced Research and Development Authority)</td>
<td>USDA</td>
<td>$1 million</td>
</tr>
</tbody>
</table>
Gaps in Mitigation-Related R&D Spending

Agricultural R&D Spending on Climate Mitigation (2017–2021 Average)

Notes: ARS mitigation and USGCRP reflect USDA estimates of enacted funding for FY21. Funding by mitigation area is not calculated owing to data limitations. Other funding is calculated based on analysis of project descriptions for 2017–2021. Columns do not sum to equal total because funding for projects can fall under multiple categories.
Thank you

Connect to learn more:
www.thebreakthrough.org
dan@thebreakthrough.org @danrejto
(Twitter)
Sustainable Agriculture Research and Education

Dr. Kristy Borrelli, Associate Director

EESI Briefing September 12, 2023
Overview

● SARE history
● Overview of SARE grant programs
● Topics of funding
● SARE future
What is SARE?

Sustainable Agriculture Research and Education (SARE) offers farmer-driven, grassroots grants and education programs. Since 1988, SARE grantees have been putting the principles of sustainable agriculture into practice on farms and ranches in every state and island protectorate.
First Authorization for a Sustainable Agriculture Program at USDA

1985 Farm Bill – Food Security Act, Title XIV, Section 1409, D(7)

Research to reduce farm input costs through the collection of national and international data and the transfer of appropriate technology relating to sustainable agriculture systems, soil, energy, and water conservation technologies, rural and farm resource management, and the diversification of farm product processing and marketing systems.
First Appropriated funding for Sustainable Agriculture at USDA

1988 Agriculture Appropriations Act – Public Law 100-202, Cooperative State Research Service

LISA - Low-Input Sustainable Agriculture

$3,900,000 for low-input agriculture as authorized by the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 4701-4710)
SARE is Born!

1990 Farm Bill – Food, Agriculture, Conservation, and Trade Act, Title XVI, Subtitle B, Section 1619. **Sustainable Agriculture Research and Education**

Purpose, Definitions, Program Administration, Authorization

**Chapter 1** – Best Utilization of Biological Applications
**Chapter 2** – Integrated Management Systems
**Chapter 3** – Sustainable Agriculture Technology Development and Transfer Program
SARE National Overview

- 1 National Outreach Office
- 4 Regional Host Institutions
  - Administrative Councils
  - Staff
- National Committees
- Professional Development Program - 1994
# SARE Grant Types

<table>
<thead>
<tr>
<th>Grant Type</th>
<th>Lead Audience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and Education</td>
<td>Researchers, Educators, Farmers</td>
</tr>
<tr>
<td>Farmer/Rancher</td>
<td>Farmers, Ranchers</td>
</tr>
<tr>
<td>On-Farm Research/Partnership</td>
<td>Educators, Service Providers, Farmers</td>
</tr>
<tr>
<td>Graduate Student</td>
<td>Graduate Students, Farmers</td>
</tr>
<tr>
<td>Professional Development Program</td>
<td>Educators, Service Providers</td>
</tr>
</tbody>
</table>
SARE Funding History

Total Funding Received: $662 Million
Total Grant Projects Funded: $412 Million*

*2023 grants still being awarded
Eligible Topics

- On-farm renewable energy
- Pest and weed management
- Pastured livestock
- Rotational grazing
- Cover Crops
- High Tunnels
- Crop Rotations
- Business Planning
- Farm Succession Planning

- Marketing
- Sustainable Communities
- Integrated Systems
- Pollinators
- Local and Regional Food Systems
- Urban Farming
- Indigenous Practices
- Farmer Mental Health
- Etc.
# SARE Funding by Topic

<table>
<thead>
<tr>
<th>Search Term</th>
<th>Total Funding</th>
<th>Total Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate</td>
<td>$4,743,663</td>
<td>74</td>
</tr>
<tr>
<td>Regenerative</td>
<td>$1,934,647</td>
<td>32</td>
</tr>
</tbody>
</table>

Includes all projects from 1988-2023
## SARE Funding by Topic

<table>
<thead>
<tr>
<th>Search Term</th>
<th>Total Funding</th>
<th>Total Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Health</td>
<td>$23,337,319</td>
<td>469</td>
</tr>
<tr>
<td>Cover Crops</td>
<td>$22,337,320</td>
<td>1331</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>$19,748,962</td>
<td>1243</td>
</tr>
<tr>
<td>Soil Carbon</td>
<td>$17,101,848</td>
<td>51</td>
</tr>
</tbody>
</table>

Includes all projects from 1988-2022
SARE into the Future

- Increased annual appropriations for funding SARE - $60 Million
  - More grants, more topics, higher amounts
  - Support to grantee

- Addressing Quality of Life in grant programs
  - Improving DEIA efforts across programs

- Provide Technical Assistance for grant management

- Evaluate program impact
Thank You!

SARE Webpage  https://www.sare.org/

SARE Projects Database  https://projects.sare.org/

Contact  Dr. Kristy Borrelli  kborrelli@sare.org
Sustainable Agricultural Research

Climate-Smart Research for the Farms of the Future
Briefing Series: Farm Bill in Focus
September 12, 2023

Lawson Connor
Assistant Professor of Agricultural Economics & Agribusiness, University of Arkansas
Farming Impacts and Agricultural Sustainability

- **External Concerns**
  - Nitrate pollution
  - Eutrophication
  - Dead-zones in downstream waterways

- **Internal Concerns**
  - Soil erosion
  - Nutrient leaching
  - Increased yield sensitivity to extreme weather events

- Further exacerbated by climate change
  - Droughts, extreme heat, excess wet conditions occur more frequently

- **Interactions with Farm Bill Programs**
  - Crop insurance effects:
  - Cover crop adoption incentives
  - Higher drought sensitivity

*Figures:* Impact of climate change on agriculture (left) and Hypoxic zones in Chesapeake bay (right). *Sources:* Crop Life International. VIMS dead-zone report
Potential for Increased Cost of Administering Farm Programs

- Increasing indemnity outlays particularly due to dry weather
  - Greater Acreage enrollment in crop insurance
  - Increased drought vulnerability

Adapted from Agri Pulse, January 25th, 2023.

Data Source: USDA RMA Summary of Business
Diversified Cropping Systems

1. Increase infiltration
2. Reduce evaporation
3. Increase soil water storage
4. Increase percolation for groundwater recharge
5. Create conditions favorable for root proliferation and deeper growth
6. Improve plant access to nutrients
7. Suppress diseases
8. Increase plant tolerance to drought
9. Increase transpiration relative to evaporation

Crop diversification
Livestock integration
Organic matter amendments
Minimum disturbance
Residue retention
Continuous living root

Promote plant-microbe interactions

Improve soil structure
Federal Funding For Conservation

- Federal funding for conservation has increased
- The largest chunk of the funding has gone to promote adoption and maintenance of cover cropped acres.

1/ Includes these programs and predecessors: Conservation Reserve Program, Agricultural Conservation Easement Program, Environmental Quality Incentives Program, Conservation Stewardship Program, Regional Conservation Partnership Program, and Conservation Technical Assistance (CTA). CTA is funded annually through appropriations; here it is assumed constant at $769 million (nominal). Spending is adjusted to constant (2017) dollars, with assumed annual inflation of 2 percent for 2019-23.

Our research has focused on addressing internal concerns in row crop agriculture.

• Addresses concerns regarding costs of program administration

• Understanding and mitigating unintended effects

Intended and Unintended effects of farm bill programs on practices adoption

Effects of practice adoption on farm economics: Drivers of heterogeneous effects

Alternative strategies for incentivizing practice adoption
Selected Outcomes

Payments from agricultural conservation programs and cover crop adoption
Byungyul Park¹ | Roderick M. Rejesus² | Serkan Aglasan³ | Yuyuan Che² | Stephen C. Hagen² | William Salas⁴

Crop insurance participation and cover crop use: Evidence from Indiana county-level data

Crop Insurance Participation Rates and Asymmetric Effects on U.S. Corn and Soybean Yield Risk
Lawson Connor and Ani L. Katchova

Understanding the effect of cover crop use on prevented planting losses
Sunjae Won¹ | Roderick M. Rejesus² | Barry K. Goodwin² | Serkan Aglasan³ | William Salas⁴
AFRI and FFAR Funding

Key Objectives

- Develop open access Cover crop dataset
- Understand heterogeneous economic effects of Rotational complexity and cover crop adoption
- Develop tool that can inform lenders of risk profiles of practice adopting fields and farms
Thanks

Contact:
Lawson Connor
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Phone: 479-575-2072
Federally Recognized Tribal Extension Program
FRTEP
Reparation of Disparities

• Prior to FRTEP, County extension offices were not serving reservations and tribal communities.

• The Federally-Recognized Tribes Extension Program (FRTEP) was initially created in the 1990 Farm Bill to address the inequities in agricultural extension offered to Native American farmers and ranchers.

• Agricultural support in the form of Extension in Indian Country is a result of a sovereign-to-sovereign relationship.

• Thirty years later, the FRTEP has never been appropriated the funding or staffing it was originally authorized.
Overview

The main priorities of the FRTEP include but are not limited to:

1. Positive youth development programs, including 4-H for tribal youth
2. Native Farmer and Rancher Productivity and Management
3. Native Community Development:
   a. Economic and Workforce Development
   b. Food Systems, Farm and Community Markets, and Food Sovereignty
   c. Natural Resource Conservation and Adaptation to Environmental Changes
   d. Human Nutrition and Reduction of Childhood and Adolescent Obesity
   e. Native Language and Culture Preservation
   f. Traditional Ecological Knowledge sharing and learning, or knowledge held by indigenous cultures about the environment or cultural practices.

- Cover crop utilizing varieties that also benefit specific local pollinator species
- Hydroponic outdoor system to grow edible perennials for transplant
- Forest garden
Agriculture as Healing

FRTEP installs agriculture programs that empower reservations and surrounding communities to grow food, restore tribal traditions and culture while building community.

**Farmer & Rancher**
Delivering science-based, culturally relevant production, marketing and financial management information to help Indian producers becoming economically successful and help build Native Nation food security.

**Adaptation to Climate Change**
Climate change is already affecting our environment. Certain regions of the U.S. will be disproportionately impacted by climate change, and these regions also often have large Tribal populations. Adaptation to climate change requires funds, innovation, and action.

**Community**
Providing outreach programs to safeguard water quality, food system development, certify pesticide applicators, preserve traditional plants and facilitate community engagement and leadership.
Regenerative Agriculture

Indigenous cultures have long been privy to the innate knowledge of many of regenerative agriculture's techniques. These practices have existed for centuries. They include a robust environmental ethical.

At present these activities are done on a small and localized scale.

Indigenous Traditional Ecological Knowledge can help shift practices toward more sustainable production nationwide.
Indigenous Traditional Ecological Knowledge

Examples of ITEK Agricultural practices from pre-colonial food production

- Multiple Cropping
- No-till farming
- Companion planting
- Fallowing fields,
- Staggering the times of plantings
- Maintaining separate plantings of different varieties
- Polycultures
Climate

**Extreme water shortages, drought or flooding**
are already impacting food production most of western states

**Soil integrity and loss**
is a national issue imperaling all current agriculture in the United States

**Inconsistent LOGS, first and last frost**
Have been observed and impact crops in many areas

**Livestock disease and expense**
Climate change can exacerbate disease in livestock, and some diseases are especially sensitive to climate change

**Climate changes will disproportionately impact Native American lands, reservations, and communities**
Conclusion

NRCS: “Rooted in Indigenous wisdom, regenerative farming is an alternative decision-making framework that offers a set of principles and practices to grow food in harmony with nature and heal the land from degradation.”

The 35 Federally Recognized Tribal Extension Programs serving Native American communities are assisting in providing food security for select tribes across the country. If expended, these programs have potential to serve all reservations where food insecurity is high.

It is imperative that agricultural systems change and adapt as climate changes. ITEK practices can contribute.
Resources

- **Beyond Extension: Strengthening the Federally Recognized Tribal Extension Program (FRTEP) [iltf.org]**
- **Home - Tribal Extension**
- **Advocating for the Federally-Recognized Tribes Extension Program » Congressional Hunger Center**
- [https://www.bing.com/click/a?i8&i2=3ad47f0b2229950fJmltdHM9MTY5NDQ3NjgwMCzZp3VpZD0wZTBIMzVhNS1hOWM2LTYzY2ktMzMy0yNmRmY0g3NTYzOGUmaw52aWQ9NTlzOQ8=3&sh=3&clid=0e0e35a5-a9c6-5-260a-75638e&psq=climate%20and%20livestock%20diseases&u=a1aHR0cHM6Ly91bmZjY2MuaW50L2ZpbGVzL2FwcGxpY2F0aW9uL3BkZi81MTYuMA&ntb=1](https://www.bing.com/click/a?i8&i2=3ad47f0b2229950fJmltdHM9MTY5NDQ3NjgwMCzZp3VpZD0wZTBIMzVhNS1hOWM2LTYzY2ktMzMy0yNmRmY0g3NTYzOGUmaw52aWQ9NTlzOQ8=3&sh=3&clid=0e0e35a5-a9c6-5-260a-75638e&psq=climate%20and%20livestock%20diseases&u=a1aHR0cHM6Ly91bmZjY2MuaW50L2ZpbGVzL2FwcGxpY2F0aW9uL3BkZi81MTYuMA&ntb=1)
- [https://www.epa.gov/climate-indicators/climate-change-indicators-length-growing-season](https://www.epa.gov/climate-indicators/climate-change-indicators-length-growing-season)
- **Advancing Racial Justice through Food Distributions on Indian Reservations | USDA**
- [https://www.feedingamerica.org/sites/default/files/2021-03/National%20Projections%20Brief%202021_0.pdf](https://www.feedingamerica.org/sites/default/files/2021-03/National%20Projections%20Brief%202021_0.pdf)
- [https://nfu.org/2020/10/12/the-indigenous-origins-of-regenerative-agriculture/](https://nfu.org/2020/10/12/the-indigenous-origins-of-regenerative-agriculture/)
Agricultural practices can have significant climate impacts – pro and con.

- Carbon dioxide, methane and nitrous oxide emissions or reductions.

Multiple benefits can flow from adopting “climate-smart” agricultural practices.

- Higher yields & reduced costs from precision agriculture.
- Resilience in the face of climate impacts.
- Incentive payments.
USDA “Partnerships for Climate-Smart Commodities” Initiative
$3+B Program
Tests proposition that farmers who produce commodities using “climate-smart” practices can sell products at higher prices.
Includes a significant focus on MMRV; presumes development of a credible MMRV-based certification process.

“Climate-Smart Agriculture & Forestry” Initiative via E.O. 14008.
Tasks USDA with evaluating incentives for the voluntary adoption of climate-smart ag and forestry practices.

Inflation Reduction Act
$19+B Funding
Allocated to existing USDA conservation programs based on Secretary of Agriculture’s confirmation of climate benefits.
$300M of the IRA funding is explicitly dedicated for the measurement, monitoring, verification, and reporting (MMRV) of carbon sequestration or methane and nitrous oxide emissions reductions.

2023 Omnibus Budget
Requires that USDA identify “widely accepted protocols” and “sampling methodologies” to ensure “programmatic integrity” of voluntary carbon markets.

New Farm Bill -- ???
Measuring, monitoring, reporting & verification (MMRV) of agricultural GHG fluxes is difficult & expensive . . .

But potential incentive payments are putting focus on climate and sustainability practices across supply chains . . .

Some voluntary carbon markets &/or ag producers are generating carbon offset/inset payments for “climate-smart” regenerative ag practices . . .

. . . due to the heterogeneity of ag soils and under-investment in ground-truthed MMRV technologies & methodologies.

. . . so major agricultural producers and farmer-suppliers need mechanisms to confirm/validate climate benefits.

. . . but the absence of broadly-accepted MMRV standards is limiting incentive payments.
Factors Holding Back Improved MMRV for Climate-Smart Practices

**Investment:** USDA traditionally has invested in broad-based models developed by land-grant universities. New technologies and methodologies are available to provide ground-truthing and scaling of area- and practice-specific climate-smart practices.

**Soil-Focus:** USDA traditionally has focused almost exclusively on carbon uptake in soils. Yet, the large majority of GHG benefits are associated with reduced methane and nitrous oxide emissions from livestock- and fertilizer-related practices.

**Data:** Proprietary data sampling & software modeling tools are proliferating in voluntary carbon markets, making public confirmation of climate benefits more difficult.
The USDA has a **historic opportunity** to address key MMRV deficiencies through coordinated implementation of:

1. new IRA funding, including its $300M for MMRV and required Secretarial confirmation of climate benefits
2. MMRV innovations piloted under the Partnerships for Climate-Smart Commodities program; and
4. Upcoming Farm Bill.

Stanford report: “Data Progress Needed for Climate-Smart Agriculture” (April 2023)
Endorse USDA’s focus on specific agricultural practices regarding soil regeneration; precision fertilizer use; livestock feed & manure management.

Lack of consensus protocols on data collection and modeling, combined with limited public availability of GHG data on soil carbon, N2O and CH4, undermines MMRV efforts.

Underscore need and opportunity for USDA to develop a comprehensive plan around climate data collection & analysis. Cite previous USDA data efforts, National Academies and White House initiatives and Congressional direction and funding on this topic.
Marshal outside experts to help USDA develop protocols for field-testing carbon in soils and methane and nitrous oxide emissions.

Support national soil monitoring network built around regional nodes to establish baseline conditions and enable trend-line analyses for both soil carbon and nitrous oxide emissions.

Develop separate methane testing and protocol development initiative.

Identify and deploy a data management platform/mechanism that collects and organizes agricultural GHG data in accessible formats.

Tie into broader White House initiative.

Encourage the development of new/revised GHG-focused agricultural models and conversion factors that are calibrated to MMRV data, with significant focus on methane.

Engage in extensive farmer outreach and technical assistance to encourage broad-based adoption of climate-smart practices.

Evaluate potential “climate-smart” certification standards and mechanisms that may be appropriate for agriculture.
What did you think of the briefing?

Please take 2 minutes to let us know at:
www.eesi.org/survey

Materials will be available at:
www.eesi.org/091223farmbill

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